

dustry. It will save much vital produce that now is lost, it will cut man labor and other costs by reducing duplicating processes, it will furnish farm and rural people with more profitable employment, it will keep more people in the rural areas where "primary" production takes place and where living and production costs are lower, and it will reduce immeasurably the wastes in transportation. Not least of all, it might be considered a program or a means of stabilizing incomes of farmers and of obtaining for them an equitable share of the national income. See pages 176-178.

Although the subject "Vertical Farm Diversification" is not new, it is one which probably will receive more and more attention from the farm operator, farm manager, and farm landlord.

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*Economic Fluctuations in the United States, 1929-1941*, Lawrence R. Klein. Cowles Commission for Research in Economics Monograph No. 11. New York: John Wiley & Sons, Inc., 1950. Pp. xi, 174. \$4.00.

*Statistical Inference in Dynamic Economic Models*, Cowles Commission Research Staff Members and Guests. Edited by Tjalling C. Koopmans, With Introduction by Jacob Marschak. Cowles Commission for Research in Economics Monograph No. 10. New York: John Wiley & Sons, Inc., 1950. Pp. xiv, 438. \$6.00.

It is, perhaps, fitting that the two long-awaited monographs of the Cowles Commission should be accorded a combined review. Monograph No. 10, an outgrowth of a Cowles Commission conference on statistical inference in economics held at the University of Chicago in January 1945, is concerned primarily with the statistical implications of the premise that economic data are generated by systems of simultaneous, stochastic, and dynamic relations. By and large the discussion in this monograph, which is addressed, one supposes, primarily to mathematical statisticians, and in which the emphasis is largely on formal mathematical proof, appears to be centered on the following problems: *Given* a system of equations subject to random disturbances (a) under what conditions can the unknown parameters of the system be estimated (identification), and (b) how can estimates of these parameters (estimates having certain desirable properties) be obtained from observations on the variables in the system? In Monograph No. 11, which is an empirical econometric study, a different range of problems has to be faced: (a) the equation system has to be given content which bears some resemblance to the economic reality the system is presumed to "structure"; (b) measurements of the variables entering into the system must be obtained, and in the (inevitable) absence of certain relevant data, the system must be modified (or compromised) accordingly; (c) tests (presumably supplied by the statistician but actually not yet available) must be applied

to determine the adequacy of the model. Monograph No. 10 is devoid of economic content; Klein's book, in its intent at least, is a substantive contribution to economics. Both monographs should be of vital concern to research personnel in agricultural economics—Monograph No. 10 because it presents in hitherto unavailable detail new ideas and tools for the analysis of economic data, and Monograph No. 11 as the first detailed lesson in the application of the new tools.

The larger monograph is a compilation by 10 different authors of 18 papers and brief notes arranged in three parts dealing respectively with simultaneous equation systems, problems specific to time series (in which the equation system framework is temporarily abandoned), and specification of hypotheses. A 50-page paper by Marschak, which this reviewer found indispensable for orderly ingestion of the main contents, prefaces the discussion. The principal paper in this collection ("Measuring Equation Systems" by T. C. Koopmans, H. Rubin, and R. B. Leipnik) treats in monographic length (184 pages) complete systems of equations which are linear and stochastic (disturbances independently distributed at different points of time), and which contain endogenous (determined within the system), exogenous (determined outside the system) and lagged endogenous variables. Identification, as a problem prior to estimation, is considered first (pp. 69-110). Necessary and sufficient conditions for identifiability in linear systems are derived under *a priori* restrictions, which consist of linear relations binding the coefficients of the same equation. The effect of other types of constraints (linear relations connecting coefficients in different equations and restrictions on the distribution of disturbances) is also discussed. Maximum likelihood estimates of the parameters of a complete linear model which utilizes all of the *a priori* information are derived, assuming, of course, that the disturbances are jointly normally distributed (pp. 110-153). The last and longest part of this basic paper (pp. 153-257) presents iterative procedures for the computation of maximum likelihood estimates made necessary by the fact that the maximization of the likelihood function under constraints leads to equations which are not linear in the estimates and which apparently cannot be solved by direct methods.

Various aspects of statistical estimation in a system of stochastic relations are touched upon in other papers. Few of the papers are fully developed: four are brief discussions given at the conference and written up apparently without much elaboration; two papers are summaries of studies that have been published in fuller form elsewhere; several other papers do not go beyond presenting and elaborating a few definitions and/or treating one or two simple examples. It is possible only to indicate briefly the subject of a few of the papers which this reviewer found particularly interesting. The specification of variables as endogenous and exogenous for purposes of statistical estimation is discussed in a stimulating paper by Koopmans

("When Is a System Complete?"). As the matter stands now, it would appear that equally large (or larger) systems may be required for the measurement of individual commodity demand and supply functions as for the estimation of the structural parameters of the macro-system of which the individual commodities are but a small part. In another stimulating paper Koopmans explores the advantages of using a continuous time dimension ("Models Involving a Continuous Time Variable"). Specification of random disturbances as nonadditive (as coefficients of the observed variables) is considered in a brief paper by L. Hurwicz ("Systems with Nonadditive Disturbances") and in a brief note by H. Rubin ("Note on Random Coefficients"). This more general specification of disturbances is probably more realistic for many economic problems, but it does give rise to difficult statistical and computational problems, particularly in a simultaneous equation system. The results obtained in another paper by Hurwicz ("Least Squares Bias in Time Series") suggest that maximum likelihood estimates of structural parameters may be seriously biased in samples of size ordinarily available for economic studies utilizing annual data.

Klein's study is a result of his work at the Cowles Commission in 1944-1947, the years during which the new approach was being rapidly developed, and the book bears the imprint of this creative and enthusiastic period. The organization of this slim but meaty volume is simple. Following a brief introduction (Chapter I) to the concepts and terminology of the simultaneous equation system approach (singularly devoid of qualifications and "hedges"), Chapter II attempts to provide the theory in terms of which economic content is to be given the equation systems. The economic system is viewed as made up of households and business firms interacting in the market; and the equation system must, therefore, reflect the behavior patterns of these decision-making units and the market constraints. In Chapter III, estimates of parameters of three models, each model more or less derived from the theory provided in the preceding chapter, are given for the period 1921-1941, and certain tests are applied. The first two models are highly aggregative and are presented largely as illustrations; Model III, consisting of 12 structural and four definitional equations, is given more substantive status. The last chapter (Chapter IV) provides a brief discussion of the adequacy of various data adjustments which had to be carried out in the course of the study.

An appraisal of Klein's able pioneering study must naturally center on the adequacy of the statistical models presented as explanations of economic fluctuations during the interwar period. And here it must be acknowledged that rigorous statistical tests of simultaneous equation models are not as yet available. In fact, little is known about the statistical properties of structural estimates in small samples, and what little is known is not particularly promising. The tests applied by Klein, such as "reasonableness"

of signs and magnitudes of coefficients, independence of residuals over time (the test used by Klein is technically suspect), and "smallness" of residuals provide suggestive indications, but can hardly serve as adequate criteria. There remains, of course, the possibility of testing the predictive power of models for years not included in the study, a possibility which is not explored in Klein's book; but here, too, the verdict may not be unambiguous. The fact that in subsequent and as yet unpublished tests for 1946, 1947, and 1948, Klein's Model III and a revised form of this model were not found to be completely satisfactory may or may not have a bearing on the adequacy of this model for the interwar period. Whatever the ultimate verdict, however, there is little doubt, at least in this reviewer's mind, that much could be learned about our economy and techniques of analysis by a continuation and extension of the work begun so ably by Klein.

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*Rural Social Systems*, Charles P. Loomis and J. Allan Beegle. New York: Prentice-Hall, Inc., 1950. Pp. iii, 873. \$6.75.

This book is designed for use as a general text for classes in rural sociology. Although perhaps a bit difficult for beginning students, it will fill an important need for intermediate and advanced courses. It differs from the usual text in this field in that it attempts to fit the traditional materials into a logical conceptual framework of sociological theory. The central frame of reference is what the authors call "social systems." These are viewed as social interactions and the cultural factors which form the structure for these interactions. On the one hand, a social system may be "considered as concrete, or a cooperative social structure such as a football team, a Farm Bureau local, a family, a church congregation, a school, or even a silo-filling ring. It can be shown that these organizations are composed of persons who interact more with members than with non-members when operating to attain their objectives" (p. 4). On the other hand, a social system may be "viewed as abstract, or one in which patterns of relationships prevail from generation to generation and from region to region. Viewed in this way, social systems consisting of elements or patterns that persist do not require that specific persons be considered as parts of the system" (p. 4).

After defining "social systems", the authors proceed to list what they regard as the more important elements of social systems. These are: (1) Roles, or that which is expected of individuals in given situations; (2) Status, or the ranking given individuals, based upon what traits and qualities that are rated high and low by members of the group; (3) Authority, or the right and power of individuals to influence others; (4) Rights and duties; (5) Ends and objectives; (6) Norms, or those rules which govern the appli-